For Jeff Blanch

CHAPTER —

Progress in Megavitamin and Orthomolecular Science

Linus Pauling

During the first half of the 20th century the several fat-soluble and water-soluble vitamins were identified, isolated, and characterized and methods for their synthesis were developed. By 1943 the Recommended Dietary Allowances (RDAs)

were formulated and published by the Food and Nutrition Board of the U.S. National Academy of Sciences—National Research Council, which has revised its recommendations about every five years. The RDAs are defined in the following way: "Recommended Dietary Allowances (RDA) are the levels of intake of essential nutrients

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considered, in the judgment of the Committee on Dietary Allowances of the Food and Nutrition Board on the basis of available scientific knowledge, to be adequate to meet the known nutritional needs of practically all healthy persons."

The Board states that the RDAs are intended to be met by a ~~variety~~ diet of a wide variety of foods rather than

by supplementation or by extensive fortification of single foods, and that they apply to <u>healthy</u> populations, not to those people with problems such as premature birth, inherited metabolic disorders, infections, chronic diseases, and the use of medications requiring special dietary and therapeutic measures.

During the second half of the 20th century it has been recognized that there is a fallacy in the definition of the RDAs. The fallacy lies in the last words of the definition, "... to meet the known nutritional needs of practically all healthy persons". Thus the "nutritional needs" are the amounts ingested by the control [redacted]

subpopulation of people in "ordinary good health". Since the nutrient intake of these people is an average one, the definition of RDA leads to values of the RDA equal to the amounts in the average diet.

With this definition, there is no possibility that the RDAs would be given values that would <u>improve</u> the health of all the people.

This fallacy is well known, even though the U.S. Food and Nutrition Board does not tell the American people about it. In their book Human Nutrition and Dietetics[2] the authors, Sir Stanley Davidson and R. Passmore, mention that the different recommendations of the national committees of Britain and the USA are related to the customary diets of the two countries [p. 242]. They

also say (p. 213) that the chief argument against recommending an intake of vitamin C that would lead to ~~provide~~ full saturation and improve the general health is that it would require a revolution in British habits to eat sufficient fruit and vegetables to provide the vitamin in this amount.

The value of megavitamins

The recognition of the value of an intake of a vitamin larger than the intake that prevents manifestations of the corresponding deficiency disease has come mainly during the second half of the 20th century. In 1937 Albert Szent-Györgyi wrote[3] that "Vitamins, if properly understood and applied, will help us to reduce human suffering to

an extent which the most fantastic mind would fail to imagine." In the period from 1940 on values of intake of vitamins somewhat larger than the RDAs were ~~given~~ tested for prophylactic and therapeutic value. The ~~amounts used were at first~~ early investigators were conservative; for example, Cowan, Diehl, and Baker, who in 1942 reported that

in their double-blind study of 343 students who received vitamin C or a placebo, with 31% less respiratory illness in the vitamin C group than in the placebo group, ~~[illegible]~~ described the daily dose of 200 mg (four times the RDA) as a "massive" dose. A dose of 20,000 mg is now considered a massive dose.

Megavitamin therapy was developed in 1952

by A. Hoffer and H. Osmond, in Saskatoon, Saskatchewan, who ~~reported~~ then began the first double-blind study ever made in the field of psychiatry. In this study, 30 schizophrenic patients a comparison was made of a placebo, nicotinic acid, and nicotinamide (each as an adjunct to standard schizophrenia treatment. The patients receiving vitamin

B3 (nicotinic acid or nicotinamide) fared better than those given a placebo: A second double-blind study with 82 patients, follow-up (Ref. 4, p. 207) Hoffer states that "A studies since 1952, and clinical experience ~~with~~ on nearly 2,000 cases treated between 1952 and 1969 have clearly established for me that the treatment of choice for schizophrenia is a

combination of megavitamins, tranquilizers, anti-depressants, and electroconvulsive therapy, combined with psychotherapy within the framework of the medical model. An example of independent corroboration is the work of Hawkins (Ref. 4, pp. 571-573). He and his clinic have treated over 4,000 cases, and the vast majority were restored to normality."

This more recent work may

be considered to be the logical consequence of earlier studies by many investigators of the value of this vitamin, which had been recognized in 1933 to the pellagra-preventing vitamin, in controlling the psychosis associated with pellagra and also in controlling depression and other psychotic states. The

early studies are described by Hoffer (Ref. 4, pp. 203-205). The RDA of vitamin B3 is 17 mg per day. In the early studies daily amounts from 100 mg to 1000 mg per day were used. Hoffer and Osmond, Hawkins, and other psychiatrists prescribe 3,000 or more mg per day, usually together with an equal amount of ascorbic acid and often with other vitamins.

The biological importance

of vitamin B-3 results from its involvement ~~in~~ with enzyme ~~systems~~. Nicotinamide is a constituent ~~of the coenzymes~~ of nicotinamide-adenine dinucleotide (NAD) and nicotinamide-adenine dinucleotide phosphate (NADP), which serve as coenzymes in many enzyme systems.

Another early investigator in the megavitamin field was Fred R. Klenner. Following the 1935 report by Jungeblut of the inactivation of poliomyelitis virus by ascorbate ion[5], Klenner before 1949 began the treatment of patients seriously ill with viral pneumonia, poliomyelitis, and other viral diseases by oral administration or venous infusion of ascorbate, often

in amounts as large as 100 g per day[6-10]. He recommended 10 to 20 g per day for prophylaxis. The biochemist Irwin Stone also played an important part in this development by marshalling the arguments about the optimum intake of vitamin C and advocating its ~~therapeutic~~ prophylactic and therapeutic use in amounts far larger than the RDA[11,12].

Orthomolecular Substances and Orthomolecular Medicine

MOST drugs have little physiological activity at doses far less than those at which they show pronounced activity, and the doses of drugs usually prescribed for the treatment of a serious illness are usually rather close to the lethal dose. In these respects the vitamins are much different. A daily intake

of 5 mg of nicotinamide is enough to prevent pellagra from developing in most people, but 50 g, 10,000 times as much, can be taken without harm. Similarly, 5 mg of ascorbic acid per day is enough to prevent scurvy in most people, but 10,000 or even 50,000 times this amount can be taken without harm. No lethal dose is known for these vitamins or for

~~other~~ most of the others — it is estimated that a single dose of 10,000,000 I.U. of vitamin A might be lethal.

Because the vitamins and some other substances have physiological activity over a great range of tolerated intakes an important question may be asked: <u>What is the optimum intake?</u>

For a vitamin the optimum intake may be

far greater than the RDA. Only during recent decades has there been serious interest in determining the optimum intakes.

In order to differentiate them from drugs, the vitamins and similar substances have been given the name <u>orthomolecular substances</u>.[13] An orthomolecular substance is a substance that is normally present in the

human body and that serves some purpose. The vitamins, essential amino acids, essential fats, essential minerals, and various other constituents of foods are orthomolecular substances, as are also various other substances, such as choline, p-aminobenzoic acid, the ubiquinones, and human proteins such as insulin and interferon.

Orthomolecular medicine is the achievement and preservation of the best of health and the prevention and treatment of disease by varying the concentrations of the orthomolecular substances in the human body. Reaching the goal may involve either increasing the concentration (of, for example, high-density lipoprotein in the blood) or decreasing the concentration (of, for example, low-density lipoprotein).